

11. Parent opinion, part 1.

- a) This is a voluntary response sample. Only those who see the ad, feel strongly about the issue, and have web access will respond.
- b) This is cluster sampling, but probably not a good idea. The opinions of parents in one school may not be typical of the opinions of all parents.
- c) This is an attempt at a census, and will probably suffer from nonresponse bias.
- d) This is stratified sampling. If the follow-up is carried out carefully, the sample should be unbiased.

13. Churches.

- a) This is a multistage design, with a cluster sample at the first stage and a simple random sample for each cluster.
- b) If any of the three churches you pick at random are not representative of all churches, then your sample will reflect the makeup of that church, not all churches. Also, choosing 100 members at random from each church could introduce bias. The views of the members of smaller churches chosen in the sample will be weighted heavier in your sample than the views of members of larger churches, especially if the views of the members of that small church differ from the views of churchgoers at large. The hope is that random sampling will equalize these sources of variability in the long run.

15. Roller coasters.

- a) This is a systematic sample.
- b) This sample is likely to be representative of those waiting in line for the roller coaster, especially if those people at the front of the line (after their long wait) respond differently from those at the end of the line.
- c) The sampling frame is patrons willing to wait in line for the roller coaster. The sample should be representative of the people in line, but not of all the people at the park.

23. Phone surveys.

- a) A simple random sample is difficult in this case because there is a problem with undercoverage. People with unlisted phone numbers and those without phones are not in the sampling frame. People who are at work, or otherwise away from home, are included in the sampling frame. These people could never be in the sample itself.
- b) One possibility is to generate random phone numbers and call at random times, although obviously not in the middle of the night! This would take care of the undercoverage of people at work during the day, as well as people with unlisted phone numbers, although there is still a problem avoiding undercoverage of people without phones.
- c) Under the original plan, those families in which one person stays home are more likely to be included. Under the second plan, many more are included. People without phones are still excluded.
- d) Follow-up of this type greatly improves the chance that a selected household is included, increasing the reliability of the survey.
- e) Random dialers allow people with unlisted phone numbers to be selected, although they may not be the most willing participants. There is a reason that the phone number is unlisted. Time of day will still be an issue, as will people without phones.